ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 119548
Proj. ECN

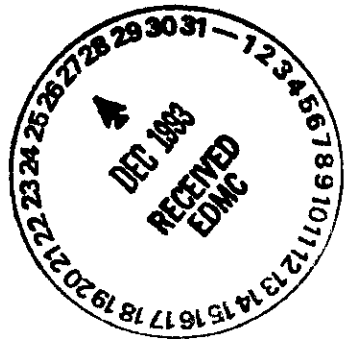
2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. Date
Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Supersedure ☐ Discovery ☐ Cancel/Void ☐	DE Scully/Effluent Technology/R3-45/3-5858	4/17/92
	5. Project Title/No./Work Order No.: project C-018H Treatment Facility	6. Bldg./Sys./Fac. No.: C-018H/242A
	8. Document Number Affected (include rev. and sheet no.): WHC-SD-C018H-QAPP-002, Rev 1	9. Related ECN No(s).
		7. Impact Level: 4
		10. Related PO No.

11a. Modification Work	11b. Work Package Doc. No.	11c. Complete Installation Work	11d. Complete Restoration (Temp. ECN only)
☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)	na	na Cog. Engineer Signature & Date	na Cog. Engineer Signature & Date

12. Description of Change

1. The name Westinghouse Hanford has been removed and replaced with "on-site contractor" and "operations and engineering contractor" at the request of the Legal department.

2. Various typographical errors have been corrected. Notably, Table 1-4 has been changed to Table 1-1 and typos in Table 3-1 have been corrected.



13a. Justification (mark one)	13b. Justification Details
Criteria Change ☒ Design Improvement ☐ Environmental ☐ As-Found ☐ Facilitate Const. ☐ Const. Error/Omission ☐ Design Error/Omission ☐	This document is being included as an appendix in the RD&D permit application document. The Legal department required the removal of the name Westinghouse Hanford before approval of the RD&D permit.

14. Distribution (include name, MSIN, and no of copies)

M. C. Arntzen	S1-54	1	Central Files	L8-04	1
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A-7900-013 (11/88)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 119548

15. Design Verification Required	16. Cost Impact		17. Schedule Impact (days)
	ENGINEERING	CONSTRUCTION	
☐ Yes	Additional ☐ $ _____	Additional ☐ $ _____	Improvement ☐ _____
☐ No	Savings ☐ $ _____	Savings ☐ $ _____	Delay ☐ _____

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	_____	☐
Environmental Report	☐	Inspection Plan	☐	_____	☐
Environmental Permit	☐	Inventory Adjustment Request	☐	_____	☐

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision

20. Approvals

OPERATIONS AND ENGINEERING	Signature	Date
Cog./Project Engineer	DE Scully	4/17/92
Cog./Project Engr. Mgr.	DL Flyckt	4/20/92
QA		
Safety		
Security		
Proj.Prog./Dept. Mgr.	WR Owen	4/17/92
Def. React. Div.		
Chem. Proc. Div.		
Def. Wst. Mgmt. Div.		
Adv. React. Dev. Div.		
Proj. Dept.		
Environ. Div.		
IRM Dept.		
Facility Rep. (Ops)		
Other		

ARCHITECT-ENGINEER	Signature	Date
PE		
QA		
Safety		
Design		
Other		
DEPARTMENT OF ENERGY		
ADDITIONAL		

A-7900-013R (11/88)

RECORD OF REVISION	(1) Document Number WHC-SD-C018H-QAPP-002	Page 1

(2) Title

Quality Assurance Project Plan for Pilot Plant Wastewater Treatability Testing

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change – Replace, Add, and Delete Pages	Authorized for Release		
		(5) Cog./Proj. Engr.	(6) Cog./Proj. Mgr.	Date
RS 1	(7) Incorporate ECN 119543 - Remove a referenced document that had not been cleared for public release.	DE Scully	DL Flyckt	10/1/91
RS 2	Incorporate ECN 119548 Remove the name Westinghouse Hanford and replace with "on-site contractor." Correct typos.	DE Scully	DL Flyckt	4/14/92

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Date Received: 4/27/92	**INFORMATION RELEASE REQUEST**	Reference: WHC-CM-3-4

Complete for all Types of Release

Purpose

[]	Speech or Presentation		[X]	Reference
	[] Full Paper	(Check only one suffix)	[]	Technical Report
	[] Summary		[]	Thesis or Dissertation
	[] Abstract		[]	Manual
	[] Visual Aid		[]	Brochure/Flier
[]	Speakers Bureau		[]	Software/Database
[]	Poster Session		[]	Controlled Document
[]	Videotape		[]	Other

ID Number (include revision, volume, etc.)
WHC-SD-C018H-QAPP-002, Rev 2

List attachments.

Date Release Required
4/27/92

Title: Quality Assurance Project Plan for Pilot Plant Waste Water Treatability Testing

Unclassified Category: UC-

Impact Level: 3

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

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Date(s) of Conference or Meeting

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Will proceedings be published? [] Yes [] No
Will material be handed out? [] Yes [] No

Title of Journal

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval Name (printed)	Signature	Date
Classification/Unclassified Controlled Nuclear Information	[]	[X]			
Patent - General Counsel	[]	[X]	per telecon by KMB for Pat Mackey		4/28/92
Legal - General Counsel	[]	[X]	per telecon by KMB for Pat Mackey		4/28/92
Applied Technology/Export Controlled Information or International Program	[]	[X]			
WHC Program/Project	[X]	[]	William R. Owen	William R Owen	4/28/92
Communications	[]	[X]			
RL Program/Project	[]	[X]			
Publication Services	[]	[X]	S.A. Forney	Susan A. Forney	4/28/92
Other Program/Project	[X]	[]	Donald L. Flyckt		4/28/92

Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	[X]	[]
Transmit to DOE-HQ/Office of Scientific and Technical Information	[]	[X]

Author/Requestor (Printed/Signature) Date
D. E. Scully D E Scully 4/27/92

Intended Audience
[] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date
D.L. Flyckt 4/28/92

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

APPROVED FOR RELEASE OFFICIAL DOCUMENT KMB Date 4/28/92

BD-7600-062 (08/91) WEF074

Part 1

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SUPPORTING DOCUMENT

1. Total Pages 60

2. Title
Quality Assurance Project Plan for Pilot Plant Wastewater Treatability Testing

3. Number
WHC-SD-C018H-QAPP-002

4. Rev No.
2

5. Key Words
wastewater, pilot plant, treatability testing, quality assurance project plan

6. Author
Name: D. E. Scully
D E Scully
Signature
Organization/Charge Code 87170/A2C24

7. Abstract

This quality assurance project plan (QAPP) applies to the Hanford wastewater treatability testing pilot plant activities and laboratory analyses conducted under the direction of the Effluent Technology unit. This QAPP is generic in approach and shall be implemented in conjunction with the specific requirements of individual wastewater test plans.

APPROVED FOR PUBLIC RELEASE KMB 4/28/92

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9. Impact Level 3

10. RELEASE STAMP

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QUALITY ASSURANCE PROJECT PLAN

FOR

PILOT PLANT

WASTE WATER TREATABILITY TESTING

D. E. Scully

April 1992

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CONTENTS

CONTENTS (cont)

FIGURE

TABLES

LIST OF TERMS

ASD	PUREX ammonia scrubber distillate
CEL	Chemical Engineering Laboratory
CLP	Contract Laboratory Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CVI	Certified Vendor Information
DOE	U.S. Department of Energy
DQO	Data Quality Objective
ECN	Engineering Change Notice
Ecology	Washington State Department of Ecology
EEDL	Engineering and Environmental Demonstration Laboratory
EPA	Environmental Protection Agency
ETF	effluent treatment facility
FDC	Functional Design Criteria
GAC	granular activated carbon
GC	gas chromatography
ICP	inductively coupled plasma
IX	ion exchange
LERF	Liquid Effluent Retention Facility
LSA	low specific activity
OSM	Office of Sample Management
PDD	PUREX Process Distillate Discharge
PLT	Process Laboratories and Technology
ppb	parts per billion
ppm	parts per million
PPSL	Plutonium Process Support Laboratory
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RE	Run Engineer
RL	U.S. Department of Energy Field Office, Richland
RO	reverse osmosis
RWP	Radiation Work Permit
SD	Supporting Document
SOP	Standard Operating Procedure
TP	Test Plan
TR	Test Report
UV	ultraviolet
VOC	volatile organic compound

1.0 INTRODUCTION

Waste waters have been generated as result of operations conducted at the Hanford Facility for over 40 years. These waste waters were previously discharged to cribs, ponds, or ditches. Examples of such waste waters include steam condensates and cooling waters that have not been in contact with dangerous or mixed waste and process condensates that are derived from dangerous or mixed waste.

Many measures have been taken to reduce the amount of contamination being discharged in these effluents. However, some of these waste waters still require additional treatment before release to the environment. Systems are being designed and built to treat these waste waters along with any future waste waters resulting from remediation activities on the Hanford Facility.

The waste waters typically contain trace levels of radionuclides and stable chemicals. Both organic and inorganic constituents normally are present and can be suspended solids or dissolved solids. While there is a wide variety of contamination in the waste waters, the level of contamination is very low. For example, the non-contact cooling water closely resembles the composition of Columbia River water; and the composition of the steam condensates and process condensate closely resembles that of distilled water.

Several treatment systems will be built on the Hanford Facility to treat waste waters. Before the treatment systems are constructed, the systems will need to be tested to verify that the treatment methods selected are effective. Usually this testing will be performed on a small-scale and is termed "pilot testing." Some testing will be conducted at the 2703E Chemical Engineering Laboratory and other onsite support laboratories. A room in the 1706-KE Engineering and Environmental Demonstration Laboratory (EEDL) (an existing structure in the 100K Area) has been selected as the site for most of the testing. Some testing (to support Project C-018H) will also be performed at the Liquid Effluent Retention Facility (LERF) located in the 200 East Area. Testing usually will be performed in two testing programs; the first program will use synthetic waste and the second program will use actual dangerous or mixed waste.

One of the first treatment systems to be constructed will treat the process condensate from the 242-A Evaporator. This will be part of the pilot plant treatability testing required to support Project C-018H, "242-A/PUREX Plant Condensate Treatment Facility." The 242-A Evaporator concentrates various liquid waste generated on the Hanford Facility. The liquid waste is stored in underground double-shell tanks (DSTs). The liquid waste in the DSTs is piped to the 242-A Evaporator, concentrated through evaporation, and returned to the DSTs for storage until final disposal. The condensate derived from this evaporation process, called "242-A Evaporator process condensate," is the waste water that will be tested. This waste water is a dangerous waste as defined by WAC 173-303. The waste is designated dangerous due to the presence of non-halogenated spent solvents (F003 and F005) and the concentration of ammonia (WT02).

1.1 PURPOSE

The treatability testing must be completed before construction of full-scale treatment systems. This testing is needed to:

- Demonstrate the technical adequacy, economic feasibility, and performance capability of new and innovative treatment technologies
- Tailor existing treatment technologies to site-specific design needs and operating conditions
- Improve the efficiency of treatment processes, refine performance capabilities, and reduce secondary waste resulting from treatment processes
- Demonstrate that treatment systems produce a treated waste water that is nonhazardous
- Provide data to support the preparation of the required environmental permits, delisting petitions, or other regulator approvals
- Provide the U.S. Department of Energy Field Office, Richland (RL) with a level of confidence that the treatment system will operate within the limits established by the environmental permits
- Provide data for full scale plant design

1.2 GENERAL WASTE WATER PILOT PLANT DESCRIPTION

Waste water pilot plant testing within the scope of this QAPP will be conducted at several locations on the Hanford Site.

- Non-radioactive waste waters (synthetic and actual) can be tested at the 2703E Chemical Engineering Laboratory (CEL). Preliminary testing of Project C-018H synthetic waste water will be conducted at the CEL.
- Most of the testing of filtration processes to support Project C-018H will be conducted at the LERF. The LERF consists of four 6.5-Mgal (24.6-ML) surface impoundments (basins) located on a 39-acre site east of the 200 East Area. The LERF receives process condensate from the 242-A Evaporator.
- Testing of synthetic, radioactive and dangerous waste will be conducted in the 1706-KE EEDL. The EEDL is located in the 100 Area. To support Project C-018H, waste water will be transported from the LERF to the EEDL by two 5,000 gal (18,927 L) tanker trucks.
- Other onsite laboratories may be utilized to conduct bench scale testing of synthetic and actual waste waters.

1.3 TESTING APPROACH

This section contains a description of the testing approach to be used at the waste water pilot plant. It includes a description of Test Plans (TP) and Testing Reports (TR). The TPs are detailed instructions for conducting the treatability tests. The TRs are the final reports describing the results of the treatability tests. This section also includes a discussion of the quality assurance approach and a description of the quality assurance program plan.

The initial step in developing the testing approach is to identify the treatment technologies that are applicable to the specific waste stream. Table 1-4 lists the treatment technologies that currently are considered to be applicable to one or more treatment systems on the Hanford Facility. Any of these treatment technologies might be used in tests conducted at the waste water pilot plant.

Waste water pilot plant testing is needed to confirm the applicability of the various treatment technologies to the specific application. The testing approach is based on the following:

- Using the smallest (capacity) treatment equipment possible that will accurately represent capabilities of the full scale treatment equipment.
- Using synthetic waste for the initial tests (when appropriate) and confirm the synthetic test data using actual waste.
- Performing tests on individual treatment operations or on combinations of individual treatment operations. The Project C-018H waste water pilot plant will be designed as a flexible unit that can be reconfigured to address multiple waste water treatment issues.

An example of this testing approach, and the initial focus of the waste water pilot plant testing activities, is the proposed testing that will support Project C-018H. Project C-018H will provide a full-scale (150 gpm) Effluent Treatment Facility (ETF) for the 242-A Evaporator and PUREX condensates.

For Project C-018H, an engineering evaluation has led to selection of the following treatment technologies: filtration, ultraviolet/oxidation, ammonia acidification, reverse osmosis, and ion-exchange. While these are the treatment technologies to be tested initially, future testing, design, or permitting activities could require the addition of treatment technologies or substitution of the secondary technologies listed in Table 1-1.

Table 1-1. Treatment Technologies.

Treatment	Technology*
Suspended Solids (e.g. grit, colloids)	
Sedimentation/clarification	Secondary
Deep bed filtration	Secondary
Cartridge filtration	Secondary
Microfiltration	Primary
Ultrafiltration	Primary
Organics	
Ultraviolet light mediated oxidation	Primary
Activated carbon adsorption	Primary
Biological treatment	Secondary
Air stripping/carbon adsorption	Secondary
Dissolved Solids (inorganics and radionuclides)	
Coagulation/flocculation	Primary
Vacuum freezing	Secondary
Chemical precipitation	Secondary
Ion exchange	Primary
Ion exchange/electrolytic regeneration	Secondary
Reverse osmosis	Primary
Electrodialysis	Secondary
Alumina adsorption	Secondary
Algasorb	Secondary
Air stripping/catalytic oxidation	Secondary
Ammonia acidification	Primary
Supported liquid membranes	Secondary

*Primary treatment technologies--applicable to one or more treatment systems.

Secondary treatment technologies--receive additional attention should primary treatment technologies fail to meet regulatory or operational needs of the Hanford Facility.

Several different scales of equipment will be tested for the Project C-018H 242-A Evaporator/PUREX condensate treatment facility. For example, small laboratory scale equipment (e.g., 1-inch columns) will be used to test ion-exchange. This scale of test has been shown to accurately represent the full scale equipment and will produce the minimum amount of waste. Larger scale equipment (i.e., 5 gallon [18.9 L/min.]) will be used to test ultraviolet/oxidation and reverse osmosis because the 5 gallon-(18.9 L/min) scale is the smallest commercially available equipment.

Testing with C-018H feed synthetics will be used for process optimization studies, to establish the treatability range, and to provide further assurance that the technology is appropriate for the type of waste to be treated. The synthetic testing will encompass a range of feed composition sufficiently wide to ensure that all plausible feeds have been evaluated. Synthetic waste will include the known average and maximum concentrations obtained from past 242-A Evaporator operations and could include constituents not historically identified in the 242-A Evaporator process condensate.

The initial set of tests will address individual treatment technologies such as ultraviolet/oxidation and reverse osmosis. Later tests will link the technologies together in a manner that simulates the flowsheet of a proposed treatment system. It is unlikely that all treatment technologies required in a treatment system ever will be combined in a single waste water pilot plant test. For example, the proposed flowsheet for the 242-A Evaporator/PUREX condensate treatment includes five treatment technologies or steps. No tests are anticipated to be needed that would link all five technologies together at one time in the waste water pilot plant.

Following completion of synthetic testing, testing with actual waste will be initiated subject to waste availability. In the example of the 242-A Evaporator/PUREX condensate treatment facility, actual waste will be a mixed waste. Tests will be conducted on the actual waste and on waste spiked with additional or higher levels of contaminants. This spiking is needed to evaluate the capabilities of the treatment technologies. During some tests, the effluent from one unit operation will be the feed to the next unit operation. This will simulate the conditions that will exist in the full scale treatment system. However, it is not intended to test a fully integrated waste water pilot plant using all the treatment technologies in series.

This quality assurance project plan (QAPP) will provide the Quality Assurance (QA), Quality Control (QC) framework for the tests conducted in the waste water pilot plant. The QAPP is intended to document various requirements that apply to all tests. Two documents will be used to manage each test conducted in the waste water pilot plant and to report the data obtained from these tests. These two documents are: Test Plans and Test Reports.

1.3.1 Test Plans

Test Plans will provide the detailed information needed to perform each test. A TP will include the purpose, objectives, procedures, and scope of a particular test. A series of TPs will be developed to address specific test

objectives. For example, a TP might be developed to address the ability of ultraviolet/oxidation to treat the range of organic constituents anticipated in the 242-A Evaporator process condensate, using a synthetic waste water. A follow-up TP will be developed to confirm the results obtained on the synthetic waste with the actual 242-A Evaporator process condensate.

It is anticipated that the results of a test will identify the need for additional testing. As an example, the testing on the actual 242-A Evaporator process condensate might indicate a lower level of treatment than was expected from the results of the synthetic testing. Additional testing could be recommended to investigate the possibility of some component in the 242-A Evaporator process condensate interfering with the performance of the ultraviolet/oxidation system.

The exact format and content of TPs will depend upon the objectives of the test. Generally TPs will contain the following sections:

- Introduction
- Description of test
- Expected results
- Test procedure
- Safety
- Quality assurance
- Organization and functional responsibilities
- Schedule
- Reports
- References

Copies of TPs will be available for the U.S. Environmental Protection Agency (EPA) or the Washington State Department of Ecology (Ecology) inspection upon request.

1.3.2 Test Reports

Test Reports are issued on the completion of a TP or on the completion of a series of TPs. These TRs will be used to transmit the results of the waste water pilot plant testing, and to incorporate the testing results into the design or permitting of the final treatment systems.

While the format of the TRs will depend somewhat on the type of testing being reported, TRs generally will contain the following information:

- Introduction
- Description of test
- Test method and test equipment
- Test results
- Conclusion and recommendations
- Disposition of test item
- References

Copies of TRs will be available for EPA or Ecology inspection upon request.

1.4 QUALITY ASSURANCE PROGRAM

The specific quality assurance requirements to be used in the waste water pilot plant are based on EPA guidelines for the *Comprehensive Environmental Response Compensation and Liability Act* (CERCLA) and the RCRA programs. Documents that detail these guidelines include the following:

- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80, (EPA 1983)
- *Test Methods for Evaluating Solid Waste*, Chapter 1 - Quality Control, SW-846 (EPA 1986)

The EPA guidelines contained in these documents have been specifically developed to ensure that activities on projects with the potential to affect human health and the environment are conducted in a manner as to support conclusions that are based on accurate, precise, and complete data.

This QAPP is intended to be generic in nature and will be applicable to testing of synthetic waste and actual dangerous waste. The QAPP will provide the overall requirements under which waste water pilot plant testing will be executed. The QAPP also will establish the requirements for the sampling and analytical services that will be provided by both onsite and offsite laboratories.

It is the intent of the QAPP to allow a graded approach to the application of quality assurance. For example, the portion of the testing activity that will be conducted for process optimization does not require the high level of quality assurance afforded to those tests that will provide data to support permitting or delisting activities. The identification of the appropriate quality assurance level for the data will be included within the associated Test Plan.

Analytical data for process optimization studies will be obtained from a Hanford Site laboratory using procedures based on EPA guidance or applicable procedures. Analytical data that are to be used in permit applications might be required to be performed offsite from a certified laboratory program (CLP) laboratory.

1.5 SCHEDULE

The waste water pilot plant will first be used to support the 242-A Evaporator/PUREX Condensate Treatment Facility. Waste water pilot plant testing with synthetic waste will be performed after the Hanford environmental compliance (HEC) environmental assessment (EA) is complete and the necessary modifications are performed to the 1706-KE EEDL and the LERF to install the waste water pilot plant equipment. The HEC EA was approved March 11, 1992.

The 1706-KE Building modifications will include: replacing loose floor tiles, sealing the floor, plugging floor drains, sealing the walls, upgrading the ventilation system, and refurbishing the change rooms.

The 242-A Evaporator has not been operational since 1989 and currently is undergoing upgrade modifications. When the 242-A Evaporator becomes operational, the 242-A Evaporator process condensate will be stored in the LERF. A minimum 2-month period will be required for the waste material to accumulate before using the material in waste water pilot plant testing. This 2-month period is necessary because of operational consideration and because of the need to obtain a representative sample of process condensate. The 242-A Evaporator waste will be available for waste water pilot plant testing between the time frame of November to December 1992.

Before any testing with actual waste from the 242-A Evaporator, an RD&D permit must be in place and an operational readiness review must be satisfactorily completed on the waste water pilot plant.

2.0 WASTE WATER TREATMENT PILOT PLANT ORGANIZATION AND RESPONSIBILITIES

An organizational chart showing the key functions for pilot plant waste water treatability testing is shown in Figure 2-1. Summaries of the primary responsibilities for each organization, particularly with respect to QA/QC, are provided in the following sections.

2.1 PROJECT MANAGEMENT

The operations and engineering contractor's Effluent Technology unit will be primarily responsible for implementing the quality requirements contained in this document. Specific quality-related responsibilities include the following:

- Monitor performance of the Process Laboratories and Technology (PLT) Section and outside contractors;
- Provide liaison between the Office of Sample Management (OSM) and outside contractors;
- Approve the TPs developed by the PLT and outside contractors;
- Review laboratory treatability activities to ensure compliance with both the TPs and this document;
- Review and approve contract deliverables with respect to compliance with contract requirements, applicable codes and standards, and other requirements as contained in this document;
- Respond to audit findings with prompt and appropriate corrective action, and;
- Prepare appropriate management reports.

2.2 ONSITE SUPPORTING LABORATORIES AND ORGANIZATIONS

The primary onsite supporting organization will be Process Laboratories and Technology. This organization includes the Chemical Engineering Laboratory, Plutonium Process Support Laboratory, Process Chemistry Laboratories, the Office of Sample Management, and other laboratory/support units.

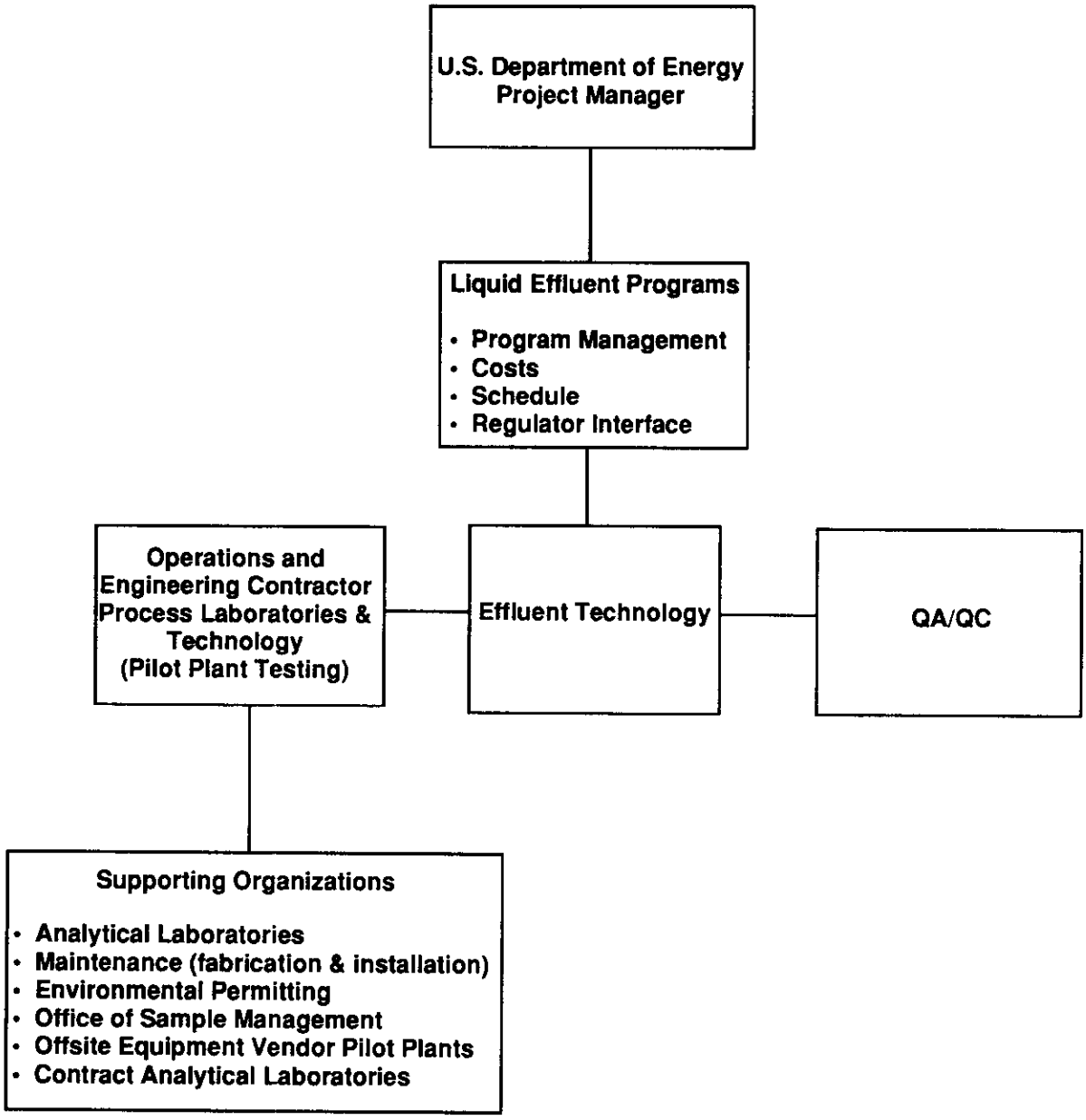

Figure 2-1. Organizational Chart for Waste Water Treatability Testing.

2.2.1 Chemical Engineering Laboratory (CEL)

This organization will be responsible for providing the technical staff and facilities to conduct the bulk of the pilot plant treatability tests for Project C-018H. The CEL will procure the pilot scale equipment for the filtration, UV/oxidation, and reverse osmosis (RO) unit operations. They will install and operate the filtration equipment at the LERF for hot (radioactive) actual process condensate testing. The UV/OX and RO equipment will be installed at the 1706-KE laboratory for preliminary testing with cold (non-radioactive) simulated process condensate. Testing with the actual hot (radioactive) process condensate trucked from the LERF will follow.

2.2.2 Plutonium Process Support Laboratory (PPSL)

This organization will be responsible for conducting the ion exchange (IX) bench scale treatability tests for C-018H. Preliminary scoping tests will be conducted using simulated feeds. Final verification tests will be conducted using hot feed as it becomes available from the 1706-KE laboratory.

2.2.3 Process Chemistry Laboratories (PCL)

This organization will conduct the bench scale boil-down tests for the evaporation of the secondary wastes for Project C-018H. Preliminary testing will be conducted using simulated cold feed. Verification tests will be conducted using hot feed as it becomes available from the 1706-KE tests.

This organization will also be responsible for many of the analytical tests conducted on the feed and effluent streams from the various cold and hot treatability tests conducted at the other onsite laboratories as described above.

2.2.4 Office of Sample Management (OSM)

The OSM will be responsible for coordinating laboratory analytical requirements and the validation of all data packages for the Project C-018H pilot plant treatability testing. This responsibility will extend to the activities of both the onsite laboratories and the offsite contractor laboratories.

2.2.5 Other Onsite Laboratory Support

Some of the C-018H pilot plant testing will likely be conducted at onsite laboratories yet to be defined.

2.3 COMMERCIAL VENDOR LABORATORIES

Some of the C-018H pilot plant treatability tests may be conducted at the laboratories of the equipment vendors. This testing is undefined at this time. However, this testing is likewise subject to the QA/QC requirements of this QAPP. The OSM will coordinate the management of samples and data packages.

2.4 U.S. DEPARTMENT OF ENERGY CONTRACTOR PILOT PLANTS AND LABORATORIES

The scope of any offsite DOE pilot plant treatability studies is also undefined at this time for C-018H. Requirements similar to those for commercial vendors will apply.

2.5 REGULATORY PERMITTING

This organization will provide guidance and assistance in obtaining any Research, Development, and Demonstration (RD&D) permits required by the EPA for pilot plant treatability testing of hazardous waste. This permit is needed prior to the planned C-018H pilot plant treatability testing of the 242-A condensate waste water.

3.0 QUALITY ASSURANCE OBJECTIVES

The data to be obtained from pilot plant treatability testing will be acquired via operational test runs per the Test Plans (TP) using the various unit operation equipment modules. For C-018H, runs will initially be made using simulated process condensate. Runs with actual process condensate from the LERF will follow.

3.1 GRADED APPROACH TO QUALITY CONTROL

Although normally a considerable amount of research will have gone into the selection of the pilot plant unit operations, the equipment modules and the planned testing will essentially be new to the onsite laboratory staff that will be performing the test runs. For these reasons, much of the preliminary testing will be for equipment shakedown/personnel familiarization. This will be followed by a period of test runs for operating parameter optimization/treatability range determination. Finally, the test runs will be made to acquire data for regulatory/design purposes.

3.2 DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQO) for each of the three test run categories will differ. The DQOs for shakedown/familiarization will be less stringent than those for optimization/treatability range determination. These, in turn, will have less stringent DQO than the runs made for proof-of concept/regulatory/permitting/design purposes. Table 3-1 is intended to provide overall guidance. This graded approach is to be used within the individual Test Plans in defining the quality level required for each run.

3.3 TEST RUN QUALITY CONTROL

The factors influencing the quality of the treatability testing results fall within the following categories: (1) pilot plant configuration; (2) operating parameters; and (3) analytical measurements. The quality levels to be assigned to each of the items within these categories will depend on the DQOs for that particular run, and are to be defined in the TP.

3.4 PILOT PLANT CONFIGURATION

Pilot plant configuration is the first of the three main categories for which quality data is required. Configuration, (i.e., the layout of vessels, pipes, instruments, sample ports, etc.), and the materials of construction of wetted parts must be controlled and documented. Pilot plant procurement specifications and procurement QA requirements will be consistent with the applicable parent project construction specification.

Table 3-1. Data Acquisition Protocol Appropriate to Test Objectives.

Quality Level	Test Objective	Equipment Configuration	Operating Parameters	Analytical Measurements
I	Equipment familiarization and shakedown.	Notebook sketch.	Recorded in notebook and on data sheets. Documentation of equipment maintenance/ instrument calibrations not required.	Data to be recorded in notebook/data sheets. Determination of precision, accuracy, representativeness, comparability, and completeness (PARCC) not required.
II	a. Optimization. b. Determination of treatability range. c. Design data.	Documented in notebook, H-drawings, vendor information, operating procedures, and/or Test Plans.	Follow approved procedure. Maintenance/ instrument calibrations to be documented.	Same as for Quality Level I above except: documentation of analytical instrument calibrations required. Analyses to be based on SW-846 or other EPA procedure as closely as possible. Deviations to be noted in lab notebook.
III	Delisting petition, RCRA permitting, and WAC 173-216 permitting data.	Same as for Quality Level II above.	Same as for Quality Level II above.	Analyses to be SW-846 or other EPA procedure (no deviations allowed). Data to be "validated" by the Office of Sample Management. Blanks, matrix spikes, matrix spike duplicates, surrogates (VOA), and determination of PARCC required.
IV	Confirmation of delisting and permitting data.	Same as for Quality Level II above.	Same as for Quality Level II above.	Analyses to be performed at CLP laboratory.

3.4.1 Material Compatibility Assurance

Material compatibility addresses the issue of assuring that the feed, intermediate, and product streams for any of the unit operations are not contaminated through contact with the pilot plant equipment materials of construction. This is of special concern for the C-018H project because of the very low levels of contamination of the feed and product streams, (i.e., parts per million [ppm] down to parts per billion [ppb]). The streams will be especially vulnerable to the absorption of organic compounds from such materials as plastic tubing or elastomeric gaskets. Similarly, the various metals used in vessels and piping must be highly corrosion resistant for the conditions anticipated.

3.4.2 Equipment Configuration Documentation

Equipment configuration is to be documented via the TP, Standard Operating Procedures (SOP), equipment Certified Vendor Information (CVI), Hanford (H-) drawings, and/or logbook sketches. Any deviations from the configuration referenced in these media shall be duly noted in the logbook account of the run. The requirement here is to assure that the equipment configuration for the particular run in question is unequivocally documented and traceable.

3.4.3 Equipment Configuration Change Control

Initial installation and subsequent change control and associated QA are to be accomplished through the onsite Job Control System, and be consistent with the applicable parent project construction specification. Engineering Change Notices (ECN) for H-drawings, and Supporting Documents (SD) for CVI and TPs, will be used to document the changes in configuration. Minor changes with low impact can be made by reference in the logbook account of the run. This call is to be made by the Run Engineer (RE) with approval sign-off by the RE's manager.

3.5 OPERATING PARAMETERS

Operating parameters are conditions of the run such as flow rate, pressure, oxidant feed rate, etc. Normally these parameters are adjustable within a given range. These are to be called out in the TPs, and the actual conditions documented.

3.5.1 Test Plans and Run Plans

The unit operation TP provides the treatability testing planned for a given unit operation, (i.e., filtration, uv oxidation, etc). This document in turn is divided into a series of run plans which cover the specific details of each run. These documents are issued by the laboratory that will be conducting the testing. Initial release and any subsequent changes are to be approved by the Effluent Technology unit. Minor changes, documented in the logbook, can be made by the RE with approval of the RE's manager.

3.5.2 Standard Operating Procedures and Change Control

An SOP is a "stand alone" document that defines the step-by-step procedure to be used to accomplish certain tasks. The SOPs can be written for any task, but are especially appropriate for tasks with many steps that will be repeated often. They are also important for tasks requiring tight procedural control for quality or safety reasons. The SOPs may be written for the purpose of performing a treatability run, or other activity ancillary to a run such as sampling or testing.

The SOP changes are to be effected through the revision process with review and approval by RE's manager.

3.5.3 Logbook Entries, Data Acquisition and Change Control

Logbook entries are to be made according to the applicable onsite laboratories' controlled manual section on laboratory notebook documentation.

The laboratory logbook contains the directory for each test run. That is, the logbook will provide the references leading to all the documentation associated with a given run. Logbook entries will also provide any sketches, notes, observations, etc., not specifically provided for in other run documentation. Any deviations to planned procedures will be noted in the logbook. The logbook will relate and tie together all the documentation generated for the test run. Each page of the notebook is to be signed and dated by the responsible Run Engineer.

Data obtained during and after the test run will be recorded either on SOP data sheets or in the laboratory logbook.

All logbook entries are to be made in ink. Any changes to the data are to be made by drawing a single line through the incorrect entry and writing the corrected entry in adjacent space. Such corrections are to be initialed and dated by the RE.

3.5.4 Reports and Data Packages, Archival

The results of the treatability test runs are to be written up as SD documents cleared for public release. The reports are to contain references to the logbook entries and any documents, data packages, etc., relevant to the test runs covered in the report.

All data sheets, logbooks, data packages, and any other documentation necessary to provide complete traceability to all documentation associated with the runs covered by the SD report are to be considered as Quality Records and archived according to QR 17.0 (WHC 1989).

Any data packages or other documentation submitted through outside vendors or CLP laboratories must be coordinated through the OSM.

3.5.5 Instrument Calibration

The unit operation test modules and ancillary equipment will be equipped with various instruments such as pressure gages, temperature indicators, flow meters, etc. These instruments must be calibrated at appropriate intervals as recommended in the CVI, or prescribed in the TP or other documentation. Calibration stickers shall be used where appropriate. Also, permanent traceable documentation of the calibrations must be maintained. Direction provided in the laboratories' controlled manual section on laboratory instrument calibration must be followed.

3.5.6 Equipment Preventive Maintenance

Various equipment pieces will require periodic preventive maintenance. For example vessels will need flushing, filter elements will need cleaning, UV lamps will need replacement, etc. These requirements must be specified in the TP or other documents and should follow the CVI recommendations where available. Documentation of preventive maintenance is a Quality Record and must be retained and traceable.

3.6 ANALYTICAL MEASUREMENTS

Analytical measurements will include the determination of physical properties and chemical composition of the various streams (feed, product, recycle, etc.) of a given unit operation's treatability testing run. Examples are turbidity determination via nephelometry, cation determination via inductively coupled plasma (ICP) atomic emission spectroscopy, and volatile organic compound (VOC) determination using gas chromatography (GC).

The Quality Level appropriate to the determination of the analytical measurements will depend on the DQOs as outlined in Table 3-1. Some measurements will be used for tuning the process during startup and need not be subject to stringent QC. Other data will be used to substantiate the conditions of the run for regulatory/design purposes and will consequently require the highest level of quality control. These distinctions will be called out in the TPs.

Analytical work for Quality Level III (regulatory/design) will require adherence to SW-846 or other EPA approved procedures by a qualified laboratory. This will require that much of this work be done by non-operations and engineering contractor. In all cases, the data packages must be managed through the OSM. If vendor analytical contracts are used, the data packages must be submitted through the vendor to the OSM.

3.6.1 Analytes of Interest and Analytical Method Selection

Table 3-2 identifies potential analytes of interest and corresponding analytical reference methods for the C-018H QA Levels II, III, and IV testing. Analytical methods are, for the most part, selected from those provided in *Test Methods for Evaluating Solid Wastes*, SW-846 (EPA 1986). Those indicated as "local" are radionuclide determination procedures developed specifically for onsite laboratories.

3.6.2 Contractual Quantitation Limits and Ranges for Analytical Precision and Accuracy

The performance of the analytical laboratory or laboratories providing support to treatability testing shall be subject to established method- and analyte-specific quantitation limits and ranges for precision and accuracy. The limits and ranges stated in SW-846 (EPA 1986) must be used whenever possible. However, these parameters may be adjusted, and must be confirmed and accepted by the operations and engineering contractor and the proposed laboratory prior to final approval of associated subcontracts or work orders.

3.6.3 Representativeness, Completeness, and Accuracy

Goals for data representativeness are addressed qualitatively by the specification of sampling locations and intervals within applicable TP. Objectives for completeness for all Quality Level III (see Table 3-1) sampling investigations shall follow the requirements stated in SW-846 (EPA 1986). Failure to meet the SW-846 requirements shall be documented in data summary reports and shall be considered in the validation process. Corrective action measures shall be initiated by the Effluent Technology unit manager and/or Quality Engineer as appropriate, through the use of the specified procedures. Approved analytical procedures shall require the use of the reporting techniques and units consistent with the EPA reference methods listed in Table 3-2 to facilitate the comparability of data sets in terms of precision and accuracy.

Table 3-2. Analytical Methods to be Used to Characterize Waste Water for Transportation and Treatment Demonstrations. (sheet 1 of 2)

Constituents	Extraction & Analytical Methods(a)	QA Level(b)
Inorganics		
Ammonia - by specific ion electrode	ASTM D1426	II,III,IV
Anions - by ion chromatography	EPA 300.0	II,III,IV
Cations - by inductively coupled plasma (ICP) atomic emission spectroscopy	6010	II,III,IV
Organics		
Semivolatile Non-Halogenated Organic Compounds - by Gas Chromatography (GC)	3510/3520 8000	II
Semivolatile Halogenated, Nitrogen Containing, and Aromatic Compounds - by GC	3510/3520 8000,8120	II
Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique	3510/3520 8270	III, IV
Volatile Non-Halogenated Organic Compounds - by GC	5030 8000,8015	II
Volatile Halogenated, Nitrogen Containing, and Aromatic Compounds - by GC	5030 8000,8021	II
Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique	5030 8260	III, IV

Table 3-2. Analytical Methods to be Used to Characterize Waste Water for Transportation and Treatment Demonstrations. (sheet 2 of 2)

Constituents	Extraction & Analytical Methods(a)	QA Level(b)
Total Organic and Inorganic Carbon	9060	II, III, IV
pH	9040	II, III
Gamma Energy Analysis	Local	II
Plutonium-Total	Local	II
Uranium-Total	Local	II
Strontium-90	Local	II
Americium-241	Local	II
Tritium	Local	II

a Methods are from SW-846 except where noted otherwise. Alternative preparative (extraction) methods are separated by a "/" with the preferred method listed first. Radionuclide methods will be performed in the onsite 222-S Laboratory using local procedures.

b QA level II Inductively Coupled Plasma Atomic Emission Spectroscopy (cold testing) will be performed in the Meteorology Laboratory. Most other QA level II methods will be performed in the 1706-KE Laboratory. Most QA Level III and all QA level IV methods will be performed offsite.

4.0 PROCEDURES

4.1 SAMPLING PROCEDURES

Treatability testing for C-018H will initially be conducted using non-radioactive simulated condensate as feed. Testing with actual process condensate from the LERF will follow. This actual process condensate will be a low-specific activity (LSA) radioactive liquid. Sampling during the testing with actual condensate shall be accomplished in compliance with the requirements of Radiation Work Permits (RWP). Laboratories selected to test the radioactive samples must be equipped and licensed for the performance of mixed waste analyses. The sampling methods appropriate for each test shall be in accordance with Table 4-1, and determined by the applicable Test Plan. Sampling shall be performed in accordance with the requirements of SW-846 (EPA 1986) for QA Levels II and III. Instructions are to include criteria for sample custody and transport of samples to an assigned laboratory for analyses.

4.2 OTHER ANALYTICAL PROCEDURES

Any additions or modifications to procedures listed in Table 3-2 shall be addressed in the individual TPs.

4.3 PROCEDURE APPROVALS AND CONTROL

4.3.1 Onsite Procedures

The onsite procedures that will typically be used to support the testing activities defined by the TPs have been selected from the Standard Engineering Practices Index, QA Program Index, and other appropriate sources. Latest approved versions of all referenced procedures shall be applicable in all cases. Selected procedures include EP-5.8, Exhibit 5 (Test Plans, Specifications, Procedures, and Reports), EP-4.2 (Testing Practices), and EP-1.12 (Supporting Documents) from *Standard Engineering Practices* (WHC 1988). Laboratory implementation of EP-1.12 is provided via the "Supporting Documents" and "Quality Control" sections of the controlled manual for the operations and engineering contractor laboratories. This "Quality Control" section contains the laboratory requirements for quality assurance program and project plans, instrument calibration, and software control. Procedure approval, revision, and distribution control requirements applicable to the EPs are addressed in EP-2.2, "Engineering Document Change Control" (WHC 1988); requirements applicable to QI and QR are addressed in QR 5.0, "Instructions, Procedures, and Drawings;" QI 5.1, "Preparation of Quality Assurance Documents;" QR 6.0, "Document Control;" and QI 6.1, "Quality Assurance Document Control" (WHC 1989). All procedures are available for regulatory review on request at the direction of the Effluent Technology unit manager.

Table 4-1. Required Containers, Preservation Techniques, and Maximum Holding Times for Waste Water Sampling.

Analyte Class	Container	Preservation	Maximum Holding Time
Semivolatile Organics	1000 ml amber glass with Teflon lined cap	Cool, 4 deg. C	Extract within 7 days. Analyze extract within 40 days.
Volatile Organics*	2 X 40 ml vials with Teflon lined septum caps	Cool, 4 deg. C	14 days
Metals-Total recoverable	1000 ml glass or polyethylene	HNO3 to pH<2 Cool, 4 deg. C	6 months
Anions	250 ml polyethylene	Cool, 4 deg. C	48 hours
Ammonia	500 ml glass	H2SO4 to pH<2 Cool, 4 deg. C	28 days
Organic Carbon	250 mL amber glass with Teflon lined cap	None if analyzed within 2 hours. HCl or H2SO4 to pH<2 Cool, 4 deg. C	28 days
Plutonium-Total	1 L polyethylene	HNO3 to pH<2	6 months
Gamma Energy Analysis	(with Plutonium)		6 months
Americium-241	(with Plutonium)		6 months
Uranium-Total	1 L polyethylene	HNO3 to pH<2	6 months
Strontium-90	1 L polyethylene	HNO3 to pH<2	6 months
Tritium	100 ml	HNO3 to pH<2	6 months

* No headspace

4.3.2 Participant Contractor/Subcontractor Procedures

Participant contractor and/or subcontractor services may be procured at the direction of the Effluent Technology unit manager. Such procurements shall be subject to the applicable requirements of QR 4.0, "Procurement Document Control;" QI 4.1, "Procurement Document Control;" QI 4.2, "External Services Control;" QR 7.0, "Control of Purchased Items and Services;" QI 7.1, "Procurement Planning and Control;" and/or QI 7.2, "Supplier Evaluation" (WHC 1989). Whenever such services require procedural controls, requirements for use of onsite procedures, or submittal of contractor procedures for review and approval prior to use, such requirements shall be included in the procurement document or work order. In addition to the submittal of analytical procedures, analytical laboratories shall be required to submit their internal QA program plans. All analytical laboratory plans and procedures shall be reviewed and approved prior to use by QA, the OSM, onsite analytical laboratories, and/or other organizations, as directed by the Effluent Technology unit manager. All participant contractor or subcontractor procedures, plans, and/or manuals shall be retained as project quality records in compliance with EP 1.14, "Engineering Records Management" (WHC 1988); QR 17.0 "Quality Assurance Records;" and QI 17.1, "Quality Assurance Records Control" (WHC 1989). All such documents shall be made available for regulatory review on request, at the direction of the Effluent Technology unit manager.

4.4 TEST PLAN ISSUANCE AND CHANGES

The TPs shall be prepared, numbered, approved, released, and updated as supporting documents per the requirements of EP-1.12, "Supporting Documents," (as implemented by the "Supporting Documents" section of the controlled manual for laboratories), and EP-4.2, "Testing Practices," of *Standard Engineering Practices* (WHC 1988). Changes to issued TPs are to be accomplished via Engineering Change Notice (ECN) as prescribed in EP-2.2 "Engineering Document Change Control".

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5.0 SAMPLE CUSTODY

All QA Level III and IV samples obtained during the treatability testing shall be controlled as specified in the "chain-of-custody" requirements found in the TPs. Chain-of-custody requirements apply as soon as sample material is introduced to the sample container within which it will be preserved, sealed, labeled, and transported to the analytical laboratory. Contract laboratory chain-of-custody procedures shall be reviewed and approved as required by onsite procurement control procedures as noted in Section 4.3.2, and shall ensure the maintenance of sample integrity and identification from receipt through the completion of the analytical process. Requirements for return of residual sample materials after completion of analysis shall be defined in the procurement documentation or work orders to subcontractor or participant contractor laboratories. Chain-of-custody forms shall be initiated for returned residual samples as required by the approved procedures applicable within the participating laboratory. Results of analyses shall be traceable to original samples through unique sample numbers or identification codes. All results of analyses shall be controlled as permanent project quality records as required by QR 17.0, "Quality Assurance Records" (WHC 1989) and EP-1.14, "Engineering Records Management" (WHC 1988).

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6.0 CALIBRATION PROCEDURES

Calibration of all onsite laboratories instruments shall be controlled as required by the "Laboratory Instrument Calibration Control System" section of the controlled manual for onsite laboratories. Routine operational checks for pilot plant equipment shall be called out in the TP, and defined in the TP or a SOP. Similar information shall be provided within approved participant contractor or subcontractor procedures.

Calibration of operations and engineering contractor, participant contractor, or subcontractor laboratory analytical equipment shall be as defined by applicable reference methods (see Table 3-2) and approved onsite analytical procedures and laboratory QAPP.

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7.0 ANALYTICAL PROCEDURES

Analytical methods or procedures based on the reference methods identified in Table 3-2 and Section 3.0 shall be selected or developed and approved prior to use in compliance with appropriate onsite procedure, work order, and/or procurement control requirements (Section 4.3.2).

Analytical procedures for QA Level I need not necessarily be based on the procedures referenced in Table 3-2. Analytical procedures for QA Level II should be based on the Table 3-2 procedures and followed as closely as possible. QA Level III analytical work shall be per Table 3-2 procedures. The QA Level IV analytical work will be done by CLP using EPA approved protocol.

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8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

Analytical laboratories shall be responsible for preparing a report summarizing the results of analysis and for preparing a detailed data package that includes information necessary to perform data validation to the extent indicated by the minimum requirements. Data reporting requirements and data package content shall comply with the appropriate requirements of Sections 1.4 and 1.5 of *Test Methods for Evaluating Solid Wastes*, SW-846 (EPA 1986) as modified by the proposed rule changes included in the *Federal Register*, Volume 54, No. 13 (EPA 1989). These requirements shall be defined in work order or procurement documentation, subject to review and approval as noted in Section 4.3.2. Data packages shall be prepared in legible, reproducible format. Any changes must be made by single-line corrections in black non-soluble ink, and must be initialed and dated. In general, all laboratory data packages should include the following:

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis, the names and signatures of the responsible analysts, sample holding time requirements, references to applicable chain-of-custody procedures, and the dates of sample receipt, extraction, and analysis.

- Instrument calibration documentation, including equipment type and model, with continuing calibration data for the time period in which the analysis was performed.

- The QC data, appropriate for the methods used, including matrix spike/matrix spike duplicate data, recovery percentages, precision data, laboratory blank data, and identification of any nonconformances that may have affected the laboratory's measurement system during the time period in which the analysis was performed.

- The analytical results or data deliverables, including reduced data, reduction formulas or algorithms, and identification of data outliers or deficiencies.

Other supporting information, such as initial calibration data, reconstructed ion chromatographs, spectrograms, traffic reports, and raw data, need not be included in the submittal of individual data packages unless specifically requested by the applicable TPs or the Effluent Technology unit manager. The QA Level III sample data, however, shall be retained by the analytical laboratory and made available for systems or program audit purposes on request by the operations and engineering contractor, the U.S. Department of Energy Field Office, Richland (RL), or the Washington State Department of Ecology (Ecology) representatives. Such data shall be retained by the analytical laboratory through the duration of the authorization work order or period of their contractual statement of work, at which point, it shall be turned over for archiving.

The completed data package shall be reviewed and approved by the analytical laboratory's QA Manager prior to submittal for validation. The requirements of this section shall be included in procurement documentation or work orders, as appropriate, in compliance with the standard onsite procurement control procedures referenced in Section 4.3.2.

8.2 VALIDATION

Validation of completed QA Level III and QA Level IV (CLP) data packages shall be performed by qualified personnel from the OSM, alternate sources as directed by the Effluent Technology unit manager, or as specifically required by individual Test Plan. Regardless of the validation services, validation requirements shall be defined within approved data validation procedures, which at a minimum shall require the following quality control QC checks.

For QA Level IV (CLP) organic analyses, validation reports shall be prepared documenting QC checks of the following areas as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* (EPA 1988a):

- Data summary narrative
- Sample holding times
- Gas chromatograph/mass spectrometer tuning and mass calibration requirements
- Continuing calibration requirements
- Method blank sample requirements
- Surrogate recovery requirements
- Matrix spike/matrix spike duplicate requirements
- Field duplicate requirements
- Internal standards performance requirements
- Target compound identification requirements
- Target compound quantitation requirements and reported detection limits
- Any tentatively identified compounds, library search, assessment, and quantitation requirements
- Overall data assessment requirements

packages, and review comments shall be retained as permanent project quality records at locations specified by the Effluent Technology unit manager, and shall be defined in procurement documentation or work orders, as specified in individual TP. Records management practices shall comply with the "Records Management" section of the onsite controlled manual for the laboratories, and QR 17.0, "Quality Assurance Records" (WHC 1989).

For QA Level IV (CLP) inorganic analyses, validation reports shall be prepared documenting QC checks of the following areas, as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (EPA 1988b):

- Data summary narrative
- Sample holding times
- Continuing calibration requirements
- Method blank sample requirements
- Inductively coupled plasma interference check sample requirements
- Laboratory control sample requirements
- Duplicate sample analysis
- Matrix spike sample requirements
- Atomic absorption QC requirements
- Inductively coupled plasma serial dilution requirements
- Overall data assessment requirements
- Sample result verification

Validation procedures for radionuclide and other types of analyses shall include requirements for QC checks with similar levels of detail.

Validation of QA Level III data packages will in include an evaluation of the following:

- Holding times
- Calibrations (initial and continuing) and instrument tune or set-up
- Precision (duplicates, MS/MSD)
- Accuracy (matrix spike, MS/MSD, surrogates)
- Laboratory blanks

as applicable to the analysis being performed. Validation procedures contained in "*Sample Management and Administration*" (WHC 1990) are to be followed.

8.3 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS

Validation reports and supporting analytical data packages shall be subjected to a final technical review by a qualified reviewer at the direction of the Effluent Technology unit manager, prior to submittal to RL and Ecology or inclusion in reports or technical memoranda. Validation reports, data

9.0 INTERNAL QUALITY CONTROL

Analytical samples shall be subject to in-process quality control measures at both the pilot plant and analytical laboratory. Unless superseded by specific directions provided in the individual TP, the following minimum field quality control requirements apply for QA III and IV sampling and analysis, and should be followed as closely as possible for QA Level II sampling and analysis. These requirements are adapted from *Test Methods for Evaluating Solid Wastes*, SW-846, (EPA 1986), as modified by the proposed rule changes included in the *Federal Register*, Volume 54, No. 13 (EPA 1989).

- **Field Duplicate Samples.** For each treatability run made within the individual TP, a minimum of 5% (or one sample, whichever is greater) of the total collected samples shall be duplicated. Duplicate samples shall be retrieved from the same sampling location using the same equipment and sampling technique, and shall be placed into two identically prepared and preserved containers. Field duplicates shall be analyzed independently as an indication of gross errors in sampling techniques.

- **Split Samples.** Field or field duplicate samples may be split in the field and sent to an alternate laboratory as a performance audit of the primary laboratory. Frequency shall meet the minimum schedule requirements for performance audits (EPA 1983).

- **Blind Samples.** Blind reference samples may be introduced into any sampling round as a performance audit of the primary laboratory. Frequency shall meet the minimum schedule requirements for performance audits (EPA 1983).

- **Field Blanks.** Field blanks consist of pure deionized distilled water, transferred into a sample container at the site and preserved with the reagent specified for the analytes of interest. Field blanks are used as a check on reagent and environmental contamination, and shall be collected at the same frequency as field duplicate samples.

- **Equipment Blanks.** Equipment blanks consist of pure deionized distilled water washed through decontaminated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks are used to verify the adequacy of sampling equipment decontamination procedures, and shall be collected at the same frequency as field duplicate samples.

- **Trip Blanks.** Trip blanks consist of pure deionized distilled water added to one clean sample container, accompanying each batch of containers shipped to the sampling activity. Trip blanks shall be returned unopened to the laboratory, and are prepared as a check on possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions. Requirements for trip blank preparation shall be included in procurement documents of work orders to the sample container supplier and/or preparer in compliance with standard onsite procurement procedures.

The internal QC checks performed by analytical laboratories shall meet the following minimum requirements:

- Accuracy and precision shall be assessed through analysis of a combination of either; (1) a matrix spike duplicate (MS/MSD), or (2) matrix spike and duplicate sample. The combination of 1 or 2 shall be analyzed at a frequency of 1/20 samples or 1/analytical batch per sample matrix, whichever is more frequent.

- Laboratory contamination shall be assessed through the analysis of an internal laboratory blank at a frequency of 1/20 samples or 1/analytical batch per sample matrix, whichever is more frequent.

Other requirements specific to laboratory analytical equipment calibration are included in Section 6.0. The minimum requirements of this section shall be invoked in procurement documents or work orders in compliance with standard onsite procedures as noted in Section 4.3.2.

10.0 PERFORMANCE AND SYSTEM AUDITS

As noted in Section 5.12 and Appendix A of *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005 (EPA 1983), audits shall be performed in environmental investigations to verify the quality of operation of one or more elements of the total measurement system. In the sense intended by QAMS-005, audits may be of two types: (1) performance audits, in which quantitative data are independently obtained for comparison with data routinely obtained by the measurement system; or (2) system audits, involving a qualitative onsite evaluation of laboratories (or other organizational elements of the measurement system) for compliance with established QA program and procedure requirements.

At a minimum, performance audit requirements shall be met for each laboratory providing support to the pilot plant treatability monitoring activities by an annual (or project) requirement for the analysis of a minimum of one blind or one split sample for each analytical method identified in Table 3-2 that is included in a particular laboratory's contract or work order (QA Level II, III, and IV only). Blind samples shall not be identified as such to the investigated laboratory, and may be made from traceable standards or from routine samples spiked with a known concentration of a known compound. Split samples shall be analyzed by an independent laboratory in compliance with approved methods based on the same reference standards as are invoked for the primary laboratory. Analytical procedures shall be approved by the operations and engineering contractor prior to use as described in Section 4.3.2 of this QAPP.

System audits shall be performed, at a minimum, on an annual basis. System audit requirements shall be implemented through the use of procedure QI 10.4, "Surveillance" (WHC 1989). Additional performance or system audits shall be performed if specifically required by individual TP, if a consequence of corrective action requirements; or if requested by the Effluent Technology unit manager, Quality Engineer, RL, or Ecology.

Any discrepancies observed during the evaluation of performance audit results or during system audit surveillance activities that cannot by immediately corrected to the satisfaction of the investigator shall be documented on a surveillance report and resolved in compliance with procedure QI 10.4, "Surveillance" (WHC 1989). Program audits shall be conducted in compliance with QR 18.0, "Audits;" QI 18.1, "Audit Programming and Scheduling;" and QI 18.2, "Planning, Performing, Reporting, and Follow-up of Quality Audits" by auditors qualified in compliance with QI 2.5, "Qualification of Quality Assurance Program Audit Personnel" (WHC 1989).

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11.0 PREVENTIVE MAINTENANCE

Measurement and testing equipment used at the pilot plant and laboratory that directly affect the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. Unique pilot plant equipment maintenance shall be called out in the TPs, and defined in the TPs or other procedures. Pilots plants and laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be included in individual methods or in laboratory QA plans, subject to review and approval as noted in Section 4.3.2. When samples are analyzed using methods based on the standards defined in Table 3-2, the requirements for preventive maintenance of laboratory analytical equipment that are defined by the appropriate reference method shall apply.

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12.0 DATA ASSESSMENT PROCEDURES

Data from RCRA pilot plant treatability testing shall be assessed as required by the applicable TP and appropriate statistical evaluation techniques that may be reference therein. Analytical data shall first be compiled and summarized by the laboratory and validated in compliance with onsite-approved procedures meeting minimum requirements of Section 8.0.

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13.0 CORRECTIVE ACTION

Corrective action requests required as a result of surveillance or audit activity shall be documented and dispositioned as required by QR 15.0, "Control of Nonconforming Items"; QI 15.1, "Nonconforming Item Reporting;" QI 15.2, "Nonconformance Report Processing"; QR 16.0, "Corrective Action Reporting" (WHC 1989). Primary responsibilities for nonconformance resolution and corrective action are assigned to the Effluent Technology unit manager and the Quality Engineer. Other measurement systems, procedures, or plan corrections that may be required as a result of routine review processes shall be resolved as required by governing procedures or shall be referred to the Effluent Technology unit manager for resolution. Copies of all surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA records on completion or closure. The project QA records location shall be specified by the Effluent Technology unit manager.

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14.0 QUALITY ASSURANCE REPORTS

As previously stated in Section 10.0 and 13.0, project activities shall be regularly assessed by surveillance and auditing processes. Surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA records on completion or closure of the activity; records location shall be as specified by the Effluent Technology unit manager. Records management requirements applicable to subcontractors or participant contractors shall be defined in applicable procurement documents or work orders as noted in Section 4.3.2. A report summarizing all surveillance and audit activities, as well as any associated corrective actions, shall be prepared by the Effluent Technology unit manager at the completion of each investigation defined by the individual TP.

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15.0 REFERENCES

EPA, 1983, *Interim Guidelines and Specifications for Preparation of Quality Assurance Project Plans*, QAMS-005/80, U.S. Environmental Protection Agency/Office of Exploratory Research, Washington, D.C.

EPA, 1986, *Test Methods for Evaluating Solid Wastes*, SW-846, Third edition U.S. Environmental Protection Agency/Office of Solid Waste and Emergency Response, Washington, Washington, D.C.

EPA, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, Hazardous Site Evaluation Division, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, Hazardous Site Evaluation Division, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1989, "Hazardous Waste Management System; Testing and Monitoring Activities (Proposed Rule);" in *Federal Register*, Vol. 54, No. 13, pp. 3212-3228.

WHC, 1988, *Standard Engineering Practices*, WHC-CM-6-1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989, *Westinghouse Hanford Company Quality Assurance Manual*, WHC-CM-4-2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Sample Management and Administration*, WHC-CM-5-3, Westinghouse Hanford Company, Richland, Washington.

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16.0 GLOSSARY

Accuracy: The closeness of agreement between an observed value and an accepted reference value. When applied to a set of observed values, accuracy will be a combination of a random component and a common systematic error (or bias) component.

Audit: Audits are considered to be systematic checks to verify the quality of operation of one or more elements of the total measurement system. In this sense, audits may be of two types: (1) performance audits, in which quantitative data are independently obtained for comparison with data routinely obtained in a measurement system; or (2) system audits, involving a qualitative onsite evaluation of laboratories or other organizational elements of the measurement system for compliance with established quality assurance program and procedure requirements. For this treatability testing, performance audit requirements are fulfilled by periodic submittal of blind samples to the primary laboratory, or the analysis of split samples by an independent laboratory. System audit requirements are implemented throughout the use of standard surveillance procedures.

Blind Sample: A blind sample refers to any type of sample routed to the primary laboratory for purposes of auditing performance relative to a particular sample matrix and analytical method. Blind samples are not specifically identified as such to the laboratory; they may be made from traceable standards, or may consist of sample material spike with a known concentration of a known compound. See the glossary entry for audit above.

Comparability: Comparability is an expression of the relative confidence with which one data set may be compared with another.

Completeness: Completeness is a qualitative parameter expressing the percentage of measurements judged to be valid.

Contractual Quantitation Limit: The contractual quantitation limit (CQL) represents the lowest level of quantitation, agreed upon by the analytical laboratory and formally established in applicable contracts or work orders, that the laboratory attests can be reliably achieved within contractually (or work order) established limits under routine laboratory operating conditions. The CQL is based on analytical experience and the data needs of individual projects; it represents the minimum acceptable standard against which analytical data will be judged. Quantitation limits (e.g., PQL as defined in SW-846 or CRQL as defined by CLP) are normally associated with organic analyses, while inorganic analyses generally reference IDL (Instrument Detection Limit) or MDL (Method Detection Limit).

Contract Laboratory Program: Contract Laboratory Program. A CLP lab is a laboratory qualified to perform analytical work per EPA approved protocol.

Deviation: Deviation refers to a planned departure from established criteria that may be required as a result of unforeseen field situations or that may be required to correct ambiguities in procedures that may arise in practical applications.

Equipment Blanks Equipment blanks consist of pure deionized, distilled water washed through decontaminated sampling or testing equipment and placed in containers identical to those used for actual field samples; they are used to verify the adequacy of sampling equipment decontamination procedures, and are normally collected at the same frequency as field duplicate samples.

Field Blanks: Field blanks consist of pure, deionized, distilled water, transferred to a sample container at the site and preserved with the reagent specified for the analytes of interest; they are used to check for possible contamination originating with the reagent or the sampling environment, and are normally collected at the same frequency as field duplicate samples.

Field Duplicate Samples: Field duplicate samples are samples retrieved from the same sampling location using the same equipment and sampling technique, placed in separate identically prepared and preserved containers, and analyzed independently. Field duplicate samples are generally used to verify the repeatability or reproducibility of analytical data.

Field duplicates are an indication of sampling precision (as well as analytical precision) and are independent of analytical batches. Frequency of submittal should be expressed as X per # of samples or per sampling event (the same is true for field and equipment blanks).

H-drawing: Controlled Hanford Site drawings defining hardware configuration, etc.

Laboratory Notebook: A controlled document used to record or reference the scope, objective, criteria, procedures, instruction, equipment configuration, operating parameters, other data, and analytical results of laboratory testing. Laboratory notebooks will reference all supporting documentation in addition to documentation and experimental results contained in other notebooks.

Matrix Spike Samples: Matrix spike samples are a type of laboratory quality control sample; they are prepared by splitting a sample received from the field into two homogenous aliquots (i.e., replicate samples), and adding a known quantity of a representative analyte of interest to one aliquot to calculate percentage of recovery. The analysis of a matrix spike sample provides an indication of analytical methodology accuracy and matrix effects.

Nonconformance: A nonconformance is a deficiency in characteristic, documentation, or procedure that renders the quality of material, equipment, services, or activities unacceptable or indeterminate. When the deficiency is of a minor nature, does not effect a permanent or significant change in quality if it is not corrected, and can be brought into conformance with immediate corrective action, it shall not be categorized as a nonconformance. However, if the nature of the condition is such that it cannot be immediately and satisfactorily corrected, it shall be documented in compliance with approved procedures and brought to the attention of management for disposition and appropriate corrective action.

Precision: Precision is a measure of the repeatability or reproducibility of specific measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is normally expressed in terms of standard deviation, but may also be expressed as the coefficient of variation (i.e., relative standard deviation) and range (i.e., maximum value minus minimum value). Precision is assessed by means of duplicate/ replicate sample analysis.

Quality Assurance: Quality assurance refers to the total integrated quality planning, quality control, quality assessment, and corrective action activities that collectively ensure that data from monitoring and analysis meets all end user requirements and/or the intended end use of the data.

Quality Assurance Project Plan: The quality assurance project plan is an orderly assembly of management policies, project objectives, methods, and procedures that defines how data of known quality will be produced for a particular project or investigation.

Quality Control: Quality control refers to the routine application of procedures and defined methods to the control of equipment configuration, operating parameter measurement, sampling, and analytical processes.

Reference Samples: Also known as Laboratory Control Samples (LCS). Reference samples are a type of laboratory quality control sample prepared from an independent, traceable standard at a concentration other than that used for analytical equipment calibration, but within the calibration range. Reference or LCS samples may not be applicable for all methodologies (e.g. organic GC/MS).

Replicate Sample: Replicate samples are two or more aliquots removed from the same sample container in the laboratory and analyzed independently.

Representativeness: Representativeness may be interpreted as the degree to which data accurately and precisely represent a characteristic of a population parameter, variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of a sampling program.

Split Sample: A split sample is produced through homogenizing a field sample and separating the sample material into two equal aliquots. Field split samples are usually routed to separate laboratories for independent analysis, generally for purposes of auditing the performance of the primary laboratory relative to a particular sample matrix and analytical method.

Standard Operating Procedure: Standard Operating Procedure. A Supporting Document (SD) internally controlled by the laboratory manager.

Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in test samples.

Trip Blanks: Trip blanks are a type of field quality control sample, consisting of pure, deionized, distilled water in a clean, sealed sample container, accompanying each batch of containers shipped to the sampling site and returned unopened to the laboratory. Trip blanks are used to identify any possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions.

Validation: Validation refers to a systematic process of reviewing a body of data against a set of criteria to provide assurance that the data are acceptable for their intended use. Validation is an assessment of laboratory performance and adherence to applicable protocols.

Verification: Verification refers to the process of determining whether procedures, processes, data, or documentation conform to specified requirements. Verification activities may include inspections, audits, surveillances, or technical review.